

# NASA TECH BRIEF



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## Evaluation of a Fluorocarbon Plastic Used in Cryogenic Valve Seals

Tests were conducted to determine the independent and interacting effects of strain rate, temperature, crystallinity, and surface finish (smoothness) on the tensile strength of a commercial chlorotrifluoroethylene plastic (CTFE) used for lipseals in very fast-acting liquid oxygen valves. The tests were statistically designed to provide the maximum amount of significant data with a minimum number of test specimens.

Approximately 200 tests were performed at strain rates between 0.02 and 10,000 inches per minute and temperatures of 75° and -320°F. Specimens of CTFE representing two different crystalline aggregates and two surface finishes were subjected to the tests.

Analysis of the test data showed that temperature and strain rate had the most significant effect on the tensile strength of the material. Surface finish and crystallinity were relatively less significant. The effects of high strain rate on tensile strength were not the same at ambient (75°F) and cryogenic temperatures. The specimens appeared to fail in a two-step process at a strain rate of 10,000 inches per minute. Additional tests would be required at a temperature of -320°F and at strain rates between 1000 and 10,000 inches per minute to determine whether the maximum

tensile strength gradually decreases as the strain rate increases or whether it rapidly decreases at some critical strain rate. From the present data, however, it was concluded that machined medium-crystallinity seals can be used as a less-expensive replacement for molded low-crystallinity seals in fast-acting cryogenic-propellant valves.

### Note:

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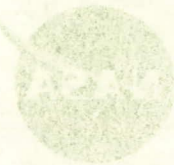
### Patent status:

No patent action is contemplated by NASA.

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under contract to  
Marshall Space Flight Center

(MFS-18189)

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# NASA TECH BRIEF

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## Evaluation of a Fluorocarbon Valve Seal

The purpose of this investigation was to determine the effect of various factors on the performance of a fluorocarbon valve seal. The factors investigated were: (1) the effect of the type of gas used, (2) the effect of the type of valve, (3) the effect of the type of seal, and (4) the effect of the type of test equipment.

The results of the investigation are as follows: (1) The type of gas used has a significant effect on the performance of the valve seal. (2) The type of valve has a significant effect on the performance of the valve seal. (3) The type of seal has a significant effect on the performance of the valve seal. (4) The type of test equipment has a significant effect on the performance of the valve seal.

This investigation was conducted by the NASA Office of Management and Administration, Washington, D.C. 20546. The results of the investigation are as follows: (1) The type of gas used has a significant effect on the performance of the valve seal. (2) The type of valve has a significant effect on the performance of the valve seal. (3) The type of seal has a significant effect on the performance of the valve seal. (4) The type of test equipment has a significant effect on the performance of the valve seal.

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